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PULPWOOD PRODUCTION STUDIES IN SHORTLEAF-LOBLOLLY PINE STANDS

by

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The Occasional Papers of the Southern Forest Experiment Station present information on current southern forestry problems under investigation at the Station. In some cases these contributions were first presented as addresses to a limited group of people, and as "occasional papers" they can reach a much wider audience. In other cases, they are summaries of investigations prepared especially to give a report of the progress made in a particular field of research. In any case, the statements herein contained should be considered subject to correction or modification as further data are obtained.

PULPWOOD PRODUCTION STUDIES IN SHORTLEAF-LOBLOLLY PINE STANDS[1/]

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In 1934 the Crossett Lumber Company gave the Federal Government 1,680 acres of second-growth pine and hardwood timberland 7 miles south of Crossett, Arkansas. The purpose of this gift was to establish a proving ground not only for testing the possible costs of, and returns from, various kinds of sawlog, pulpwood, and post and pile cuttings, but also to provide an area on which to determine the costs of handling timber as a crop and the returns therefrom.

Shortly after receiving the gift, the Southern Forest Experiment Station began a series of experiments on timber growing. Among these experiments was one in thinning old-field and natural second-growth pine stands for pulpwood, some of the interesting results from which I shall discuss.

In order to provide for future cuts, it is necessary to leave a good stand each time an area is cut over. We do not know, however, the exact number of trees that should be left to obtain the largest possible returns from our timberland. Should we leave 50, 100, 200, or even more trees per acre? Will greater returns be obtained by leaving the larger trees instead of the smaller ones at the time of cutting? What sized trees will yield the greatest profits if removed, and what sized trees will show the greatest increase in value if left at the time of cutting? The purpose of our experimental work is to answer some of these questions, and for this purpose we have established the following 1-acre test plots:

Test #1. We left about 200 of the straightest, cleanest, and best trees per acre spaced as evenly as possible (average spacing 15 x 15 feet). All straight trees under 6 inches d.b.h. not interfering with the crop trees were also left. The volume of pulpwood in the reserved trees was 24.4 cords. The cut removed 239 trees, from which 12.2 cords of pulpwood were produced.

Test #2. We left about 100 of the straightest, cleanest, and best trees per acre (average spacing 21 x 21 feet). Here also were left all straight and promising trees under 6 inches d.b.h. that did not interfere with crop trees. On this area we left 14.5 cords of wood per acre in reserved trees and cut 291 trees or 24.4 cords.

Test #3. We left about 70 of the straightest, cleanest, and best trees per acre (average spacing 25 x 25 feet) and also the straight and clean trees under 6 inches d.b.h. The amount of material left per acre was 13.5 cords, while we cut 240 trees or 27.8 cords per acre.

1/ Presented before Group #4 of the Southern Pine Pulpwood Industry at Crossett, Arkansas, November 18, 1937.

Test #4. We left about 40 of the best trees per acre (average spacing 33 x 33 feet), plus the straight and clean trees under 6 inches d.b.h. On this area we left 8.4 cords per acre, and cut 285 trees or 30.4 cords per acre.

Test #5. We left all trees up to (and including) 7.5 inches d.b.h. with the exception of leaning trees and trees with rot. We also left one good seed tree every 50 feet. On one plot cut under this method 201 trees were left per acre and on another 67 trees per acre, amounting to 13.3 and 6.7 cords, respectively. On the first plot we cut 24.6 cords per acre and on the second 45 cords.

Although it will be some time before we know exactly the type of cutting that will yield the greatest yearly income, present results indicate that for timber stands averaging up to 10 inches in diameter, a type of cutting in which between 100 and 200 of the best trees are left per acre will prove most profitable. Unless such timber is on very poor soil, one can reasonably expect such a stand to grow each year an equivalent of one cord per acre. This means that it will be possible to go back to the same area and cut the equivalent of 5 cords of pulpwood every 5 years at least until the trees reach sawtimber size. Many of the reserved trees will develop into high-quality trees, which if cut into sawlog and piling will be worth from three to ten times the value of such trees when cut for pulpwood. It is hardly necessary to add that potential sawtimber and piling trees should not be cut for pulpwood if the greatest profit from growing timber is the aim of our timber farming.

It will be noted that our pulpwood-cutting Test #5 follows almost exactly the cutting rules of the American Pulpwood Association, under which pulpwood producers are now working. The only difference is that we left a good seed tree every 50 feet in order to be sure of obtaining reproduction in case most of the present stand should be destroyed by fire or wind. Under the Association cutting rules, in some cases a very good stand will be left, but in other cases practically everything will be cut. In spite of heavy cutting in the shortleaf-loblolly pine type, most areas will undoubtedly reseed to trees and eventually another crop of timber will be produced. The resulting annual income per acre, however, is likely to be low, owing to the fact that it will be many years before the trees become of merchantable size. The costs per acre, on the other hand, will be the same as for areas containing high-quality growing stock.

The pulpmills in this country will require many years to depreciate their investments, and throughout all of these years they will need at least as much wood as is needed this year. The contractors producing pulpwood for these mills also will be in business during these years and will need timber to cut. It is the wish and aim of each timberland owner to make as much money as possible each year from his timberlands. To all who are interested in growing and producing pulpwood let us urge you, for your own good, to seriously consider the Association rules only as a minimum or as a starting point in determining the kind or amount of timber you should leave at the time of each cut. To abide strictly by the rules means that in some cases you will not net enough from the growth on the remaining trees to pay for the taxes, whereas if you leave a good stand at the time of each cut, there is no evident reason why you cannot net at least $1.00 per acre per year from the

growth. You will all agree that you can't chop out two out of every three rows of cotton and still hope to get much of a yield per acre. Neither can you cut out two-thirds of your tree crop and hope to get much in the way of returns from growth. Those of you who expect to be in the pulpwood production business for a long time in the future will also agree, it is hoped, that pulpwood stands close at home, or close to the pulpmill, are cheaper to cut and haul than stands 30 to 50 miles distant.

In all of these cuttings we have kept records of the costs of cutting pulpwood from trees of each size-class in order to determine whether some trees were costing more to cut than the value of the products obtained. These records, which we have on some 4,000 trees, indicate the number of minutes it takes to cut a tree into pulpwood and the corresponding pulpwood volume in the tree. From this information we have determined the cost of cutting a cord of wood (including felling, bucking, saw-filing, oil, and wedges) as follows:

Tree diameter (at 4½ ft. from the ground)	Cost of cutting per cord
4-5.9 inches	$1.40
6-8.9 inches	.90
9-11.9 inches	.72
12 inches and above	.76
Average of all trees cut	.80

Thus, on the basis of the number of minutes per cord, the cost of cutting trees 4 to 5.9 inches d.b.h. is almost exactly double the cost of cutting a cord from trees 9 inches d.b.h. and above. Since the sale value of the pulpwood was $2 per cord, a margin between sale value and cost of production remained for stumpage and profit in all size-classes, but this margin was greatest in the 9-11.9-inch class and was least in the 4-5.9-inch class; for the total volume cut it averaged $1.20 per cord.

We know, of course, that many of you are having your cutting done by contract at so much per cord, regardless of the size of trees, so that it actually does not cost twice as much to cut trees 4-6 inches d.b.h. as to cut trees over 9 inches d.b.h. It does, nevertheless, cost considerably more to cut small timber even by contract, because it is necessary to have additional saw crews to cut the same amount of wood; and this means additional cost for more saws, more saw-filing, more wedges, and more oil. Also the hauling cost is somewhat greater for small wood than for large, and it costs considerably more to convert a cord of small wood into chips at the plant than it does to convert a cord of large wood. One should cut small trees into pulpwood only when clearing the land for farming or if the trees are badly suppressed, rotten, or crooked.

Not only does it cost more per cord to produce pulpwood from smaller trees than from larger ones, but the value per tree is very much less for the smaller trees. On the average, to make a cord of wood it takes about 106 four-inch trees, 50 five-inch trees, 27 six-inch trees, 16 seven-inch trees, 11 eight-inch trees, and 4 twelve-inch trees. With pulpwood stumpage at 75¢ per cord, 4-inch trees are worth about 3/4¢ each, 5-inch trees about 1-1/2¢ each, 6-inch trees about 2-3/4¢, 7-inch trees about 4-1/2¢, 8-inch trees

about 7¢, 9-inch trees 9-1/2¢, and 12-inch trees about 20¢ each. (See table 1 for values of trees 4-15 inches d.b.h.) Thus 8-inch trees have a stumpage value 10 times that of 4-inch trees, while the cost of production is only half as much per cord.

On the other hand, we have found that small trees, with reasonably good crowns and spacing, are increasing in value at an extremely rapid rate. For instance in growing 1 inch in diameter a 4-inch tree increases 114 percent in value, a 5-inch tree 80 percent, a 6-inch tree 70 percent, and a 7-inch tree 50 percent. Surely most of us, as well as other timberland owners, could be interested in making 70 or 80 percent on our money in about 3 years.

Table 1. --Volumes and pulpwood stumpage values of shortleaf and loblolly pine by tree-sizes on the Crossett Experimental Forest

Diameter at breast height	Volume per tree	Number of trees per cord	Pulpwood value per tree at 75¢ per cord stumpage	Value of 1 inch of growth in diameter	Increase in value for 1 inch increase in diameter
Inches	Cubic feet		------- Cents -------		Percent
4	0.8	106.2	0.7	0.8	114
5	1.7	50.0	1.5	1.2	80
6	3.1	27.4	2.7	1.9	70
7	5.2	16.3	4.6	2.3	50
8	7.8	10.9	6.9	2.5	36
9	10.7	7.9	9.4	3.0	32
10	14.1	6.0	12.4	3.5	28
11	18.0	4.7	15.9	3.9	25
12	22.4	3.8	19.8	4.1	21
13	27.1	3.1	23.9	4.4	18
14	32.1	2.6	28.3	4.7	17
15	37.4	2.3	33.0	5.1	15

Quite often we hear the statement: "I can't afford to leave small trees because I have purchased all the pulpwood on this forty, and if I don't cut it all I will lose money." In a very few cases this may be true. There is one way, however, to buy pulpwood so that you may be absolutely certain to pay for only the amount that you cut: that is to buy on the cord basis. Such a method is absolutely fair to both buyer and seller and you do not have to worry as to whether your estimate of the amount of timber is correct. In fact you do not have to make an estimate. The only reason for buying timber on the 20- or 40-acre basis is because you think you can fool the seller on the amount of pulpwood present, and the man who owns the tract of timber thinks he can fool you. It's like buying a "grab-bag" package at a charity sale; you don't know what you've got until you unwrap it. But if you purchase by the cord both you and the landowner will know that you will get what you pay for. Furthermore, both of you can afford to leave a good stand at the time of cutting.

I have just one more thought to leave with you. I know that many contractors require the cutters to "pen" their wood, apparently as a means of "paying off." Of course there is nothing very wrong with this practice, especially if cutters are plentiful and you do not care how much wood each crew cuts per day. If labor is scarce, however, or if you are interested in having each crew cut as much as possible each day, then you should seriously consider changing this practice. We have tried both penning and not penning, and we find that loading costs when picking the wood off the ground differ very little if at all from those when loading the wood from pens. We have also found that it requires a fifth to a fourth of a crew's time to do the penning. Our crews would rather cut an extra 50 sticks of wood per day than spend that time in penning. This is, therefore, a way to obtain cheaper wood. In place of paying for the cutting on the basis of number of pens, we pay so much per 100 sticks and find that this method is entirely satisfactory. If the crews are not honest in their count or can't count, we assign each crew to a definite area and pay off on the number of cords that are hauled from that area. This also has proved to be a very satisfactory method.

In conclusion, let me repeat that our studies show that there are possibilities of large returns from timber growing, either as pulpwood alone or for pulpwood in combination with logs and poles and piling. In order to obtain these returns, however, it is necessary that we use the same common sense and good management in harvesting the crops of timber that we use in converting the wood into paper or boards. And I cordially invite all of you to visit the Crossett Experimental Forest and to see the results of these studies on the costs and returns of growing timber as a crop.